

U.S. Patent Application Serial No. 10/568,420
Amendment filed September 7, 2010
Reply to OA dated August 11, 2010

REMARKS

Claims 1-18 are pending in this application. Claims 1, 8-10, and 15 are amended herein. Upon entry of this amendment, claims 1-18 will be pending. Entry of this amendment and reconsideration of the rejections are respectfully requested.

No new matter has been introduced by this Amendment. Support for the amendments to the claims is detailed below.

Claim 15 is rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office action paragraph no. 2)

The Examiner states that there is insufficient antecedent bases for "the conductive agent" in claim 15, line 7. The rejection is overcome by the amendment to Claim 15, which has been amended to introduce "a conductive agent" at lines 4-5.

Claims 1-7 and 13-14 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hosoya et al. (U.S. 2002/0124386) in view of Yoshino et al. (U.S. 5,631,100). (Office action paragraph no. 6)

Claims 8-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hosoya et al. (U.S. 2002/0124386) in view of Yoshino et al. (U.S. 5,631,100) as applied to claim 1 above, and further in view of Johnson et al. (U.S. 5,601,951). (Office action paragraph no. 7)

Reconsideration of the rejections is respectfully requested in view of the amendment to claim

1. Claim 1 has been amended to recite: “wherein the positive electrode active material-containing layer contains a conductive agent and the conductive agent has BET specific surface area of 15 m²/g or greater.” Support for this amendment may be found in claims 8-10, which have been accordingly amended.

The invention according to the amended claim 1 is characterized in that: the positive electrode contains an olivine-type lithium phosphate as a positive electrode active material, the surface of the positive electrode current collector has a mean surface roughness Ra of greater than 0.026 μm, the positive electrode current collector has a thickness of less than 20μm, and the conductive agent has a BET specific surface area of 15 m²/g or greater.

The examiner points out that Hosoya discloses the olivine-type lithium phosphate and the thickness of the positive electrode current collector, Yoshino discloses the mean surface roughness Ra of the positive electrode current collector and Johnson discloses the BET specific surface area of the conductive agent, and that it is obvious to combine them.

However, the battery according to Johnson is different from those of Hosoya and Yoshino in that the positive electrode and the negative electrode are formed of carbon, both of which contain no lithium before cell reaction. If the positive electrode of Hosoya were replaced by that of Johnson, the battery of Hosoya would run short of Li and could not work as a battery. That means Hosoya and Johnson are totally different as batteries. Accordingly, one of ordinary skill in the art cannot be motivated to combine Hosoya and Johnson. Further, Hosoya describes in [0175] that acetylene black

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is used as an electrification agent, whereas Johnson describes in column 1, line 25, that acetylene black causes the solvent to be reduced. There is no reason why one of ordinary skill in the art would be motivated to use acetylene black, which has a BET of 60-70m²/g that is ideal for causing the solvent to be reduced, as an electrification agent of Hosoya.

Yoshino teaches that LiCoO₂ or the like can be used as a positive electrode active material (Column 3, line 28). As described in the specification of the present application at [0014], those positive electrode active materials have excellent electronic conductivity and adherence property, and therefore, the charge-discharge characteristics do not vary greatly depending on the mean surface roughness Ra of the surface of the positive electrode current collector. As demonstrated in Table 1 of the present application, the mean surface roughness Ra of the surface of the positive electrode current collector takes effect remarkably when a positive electrode active material such as olivine-type lithium phosphate having poor electronic conductivity is used. Accordingly, it is difficult to expect the effect of the present invention by referring to Yoshino, and it is not obvious to combine Hosoya and Yoshino.

It is not obvious to combine Hosoya and Johnson. It is not obvious to combine Hosoya and Yoshino, either. Accordingly, it is not obvious to combine Hosoya, Yoshino and Johnson. Claims 1-12 are not obvious over these references, taken separately or in combination.

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Claims 15-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hosoya et al. (U.S. 2002/0124386) in view of Johnson et al. (U.S. 5,601,951). (Office action paragraph no. 8)

The rejection of claims 15-18 is respectfully traversed and reconsideration is requested.

The invention according to the amended claim 15 is characterized in that: the positive electrode contains an olivine-type lithium phosphate as a positive electrode active material, the conductive agent has a BET specific surface area of 15 m²/g or greater, and the positive electrode active material-containing layer has a filling density of 1.7 g/cm³ or greater.

The examiner points out that Hosoya discloses the olivine-type lithium phosphate and the filling density and Johnson discloses the BET specific surface area of the conductive agent.

However, as discussed above for the rejection of claim 1, the battery according to Johnson is different from that of Hosoya in that the positive electrode and the negative electrode are formed of carbon, both of which contain no lithium before cell reaction. If the positive electrode of Hosoya were replaced by that of Johnson, the battery of Hosoya would run short of Li and could not work as a battery. That means Hosoya and Johnson are totally different as batteries. Accordingly, one of ordinary skill in the art would not be motivated to combine Hosoya and Johnson. Further, Hosoya describes in [0175] that acetylene black is used as an electrification agent, whereas Johnson describes in column 1, line 25, that acetylene black causes the solvent to be reduced. It is unclear why one of ordinary skill in the art would be motivated to use acetylene black, which has a BET of 60-70 m²/g that is ideal for causing the solvent to be reduced, as an electrification agent of Hosoya.

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Accordingly, it is not obvious to combine Hosoya and Johnson, and claims 15-18 are not obvious over these references.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicants' undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosure: Petition for Extension of Time